and position of such a body enabled him to present to the Academy, on June 1, 1846, a paper predicting the position of the unknown planet. Three months later, Galle examined this portion of the heavens at the request of LeVerrier, and discovered a star within two degrees of the computed place, which was not on the maps, and which proved to be the new planet. This discovery was at once received with the greatest enthusiasm. Honors poured in on LeVerrier from every side, and it was even proposed to name the planet from him. Fortunately, however, as in the case of Uranus, cooler judgment prevailed, and the precedent of naming the planets from the Roman deities was not broken. It afterwards appeared that the English mathematician, Adams, was engaged on this same problem, though by a less rigorous method, and an equal share of the glory of the discovery was claimed by his friends for him. It has also been shown that by making different assumptions LeVerrier might have arrived at widely different results. The fact, nevertheless, remains, that LeVerrier was the first to predict on theoretical grounds the true position of the unknown planet, and that in consequence of this prediction Neptune was discovered.

On the death of Arago in 1854, LeVerrier was appointed his successor as Director of the Paris Observatory. In 1870, he was removed from this position, but reinstated in 1873, when he resumed the publications of the "Annals of the Observatory," which had been discontinued during his absence. Although a mathematician rather than an observer, he introduced many important changes in the work of the Paris Observatory, and greatly increased its efficiency. For many years, he was a senator and member of the Superior Council of Public Instruction, and was thus enabled to render material aid to the cause of higher education in France. He was the originator and President of l'Association Scientifique de France, and to him is its success largely due. During the last year of his life, he was much interested in International Meteorology, and succeeded in establishing a great number of stations in France. After an illness of about six months, he died on the morning of September 23d, 1877, on the thirty-first anniversary of the discovery of Neptune.

HENRI VICTOR REGNAULT.

HENRI VICTOR REGNAULT was born at Aix-la-Chapelle on the 21st of July, 1811, and died in Paris on the 19th of January of the present year. He obtained, while still a lad, a position in a drapery

establishment in Paris; but after some time was able to enter the École Polytechnique, where he remained two years. After spending eight years in the Department of Mines, he obtained a professorship at Lyons, and entered upon the field of research of organic chemistry. The peculiar character of his mind showed itself at once in his new career. He paid no attention to the theories of the day, but worked diligently at the accumulation of materials. A great number of valuable investigations soon followed. Among them, we may notice especially his researches on the action of chlorine upon ether, and upon the chlorides of ethyl and of ethylene; researches which still retain their value and interest, as the physical properties of the bodies which he obtained were studied with unusual care and thoroughness. In 1840, Regnault was appointed professor in the École Polytechnique, and in 1841 he became Professor of Physics at the Collége de France. There he began his life-work in physics by a careful and masterly study of the specific heats, first of the elements, and afterward of compounds. He devised for this study the calorimeter which bears his name, and his results have, to the present day, been standards of accuracy. He established the law of Dulong and Petit for the greater number of the elements, and showed that for many compounds the atomic heat of the whole is the sum of the atomic heat of its constituents. He next undertook, by order of the Minister of Public Works, a series of investigations to determine the principal laws and numerical data which are required in the theory of the steam-engine. Then followed the finest series of experimental determinations of physical constants which has ever been executed by one man, in any age or of any nation. Ten of these memoirs are contained in Volume XXI. of the Memoirs of the Academy of Sciences in Paris, and three others of great length in Volume XXVI. of the same work. These papers, now familiar to all physicists, embrace the following subjects: —

1. The Expansion of Gases and Dry Vapors, the Coefficients being determined under a Constant Pressure and under a Constant Volume; at High and at Low Pressures.

2. The Determination of the Densities of Gases.

3. The Determination of the Weight of a Litre of Air, and of Nitrogen, Oxygen, Hydrogen, and Carbonic Dioxide.

4. On the Measure of Temperatures.

5. On the Absolute Dilatation of Mercury.

6. On the Law of the Compressibility of Elastic Fluids.

7. On the Compressibility of Liquids, and especially that of Mercury.

8. On the Elastic Forces of the Vapor of Water at Different Temperatures.

9. On the Latent Heat of Aqueous Vapor at Saturation under Different Pressures.

10. On the Specific Heat of Water at Different Temperatures.

11. On the Specific Heat of Elastic Fluids.

12. On the Elastic Forces of Vapors.

13. On the Latent Heats of Vapors under Different Pressures.

For every one of these investigations, an original method was pursued, and original apparatus was devised. The numerical results obtained form the basis of the modern science of thermics, and are quoted upon almost every page of works on the higher generalization known as thermo-dynamics. The memoirs cited above are by no means, however, the only contributions which Regnault made to his favorite branch of physics. A great number of minor papers contain important additions to our knowledge of physical data, or to our instrumental means of research. From time to time, he resumed and added to the work of his earlier years, taking up single and special points for investigation. In 1847, Regnault published a work on chemistry in four volumes, written with remarkable clearness, and containing many physico-chemical methods which are still in use; as, for example, a very elegant exposition of the theory and use of two of his own forms of the air-thermometer. This work was translated into several languages, and passed through several editions. In 1854, he became director of the porcelain manufactory at Sévres. During the war with Germany in 1870, Regnault lost his son Henri, an artist of extraordinary promise; and, after the final treaty of peace, he returned to his laboratory to find that the results of an elaborate investigation on the heat of expansion of gases had been completely destroyed during the German occupation of the town.

Regnault possessed in a remarkable degree the talent for devising apparatus and methods for the determination of physical constants. It is safe to say that with him began a new era in experimental physics. His mathematical powers were at least respectable, yet he seems never to have employed the modern mathematical processes for the treatment of his numerical results. He never devised experiments which, like sounding-lines, reached the depths of the unknown. Experiment was not with him, as with Faraday, an instrument of discovery, but only a most refined and beautiful instrument of observation. He never theorized, he drew no deductions from his own work, but he laid at the feet of the great architects of science grand and shapely

blocks of material, with which they built and are still building. He seems to have had no conception whatever of the modern science of Energy or even of the principle of equivalent transformations, and yet this whole branch of knowledge has grown up since he began to work, and he himself largely, though indirectly, contributed to its growth. Let us not undervalue his rare and beautiful talent, — a talent which rose almost to the level of genius. For, if there are higher qualities of intellect, there are none which are upon the whole more useful, or which contribute more to the advancement of physical science.

LOUIS ADOLPHE THIERS.

Louis Adolphe Thiers, the veteran Statesman and Historian of France, died near Paris on the 3d of September last, in the eighty-first year of his age. He was born at Marseilles, on the 16th of April, 1797. Without any early advantages of family or fortune, he won for himself a name and a fame which will not soon be forgotten. He was a man of untiring industry, of extraordinary intellectual vigor, and of intense ambition. Distinguishing himself first as a Journalist in Paris, he soon turned his pen to the preparation of a History of the French Revolution from 1789 to 1799, and had published ten volumes before he had reached his thirtieth year. After an interval of twenty years, he resumed his historical labors; and, between 1845 and 1857, sixteen or seventeen volumes of his great work, "L'Histoire du Consulat et de l'Empire," were given to the press. Meantime, he had been a leading and devoted member of the Chamber of Deputies, and more than once a Minister of State, under Louis Philippe. But his most important political services were rendered after the fall of the Second Empire. His negotiations with Bismarck, and his liberation of the territory of France from foreign occupation, were conducted in a manner, and with a success, which commanded the admiration of his whole country; and he was soon hailed, almost by acclamation, as the First President of the new Republic. He had resigned that office before his death; but the Republicans of France still looked to him as their ablest and most skilful counsellor, and relied on him in every hour of difficulty and danger. He maintained to the last that the Republic was the only form of government then possible for his country, and never ceased to urge upon the people to show that "the Republic is a government of order, peace, and liberty." While Thiers, at the period of his death, thus stood foremost among the statesmen of France, he held also no second rank as a writer and an author;